THE EFFECTS OF REPEATED LISTENINGS ON THE PITCH ACCURACY OF FIRST-GRADE CHILDREN

A Thesis

by

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The purpose of this study was to investigate the effect of repeated listenings to a song being learned on the pitch accuracy of first-grade children. Twenty-five subjects from two intact first-grade classes at Startown Elementary School in Newton, N.C. were taught a song in music class by the same state-certified music educator. Following the music class in which the song was learned, all subjects were administered a pretest consisting of tape recording each child singing the song. Five days of treatment followed in which the experimental group (n = 11) received four listenings four times a day to the song. The control group (n = 14) received no additional listenings. Each group received a 10-minute review of the song during music class. Following treatment, a posttest was administered in the same manner as the pretest. The tests were evaluated for pitch accuracy using an altered version of the Rutkowski (1986) scale, ranging from 1, for subjects who only chanted the text; to 4, for subjects who sang the entire song correctly. The scores were evaluated using a test of repeated measures. There were no significant differences (p <.05) in pitch accuracy skills attributed to group or gender. A significant difference (p = .002) was found between the pre- and posttest scores of all subjects. Furthermore, the greatest increase in mean scores from pretest (m = 2.4) to posttest (m = 3.2) was demonstrated among the females (n = 5) in the experimental group.

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This thesis is dedicated to
musician and teacher

JOE DELL RUST

whose influence made this work possible.

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CHAPTER 1

Introduction

History of Vocal Instruction

Vocal instruction for children has been a primary component of public school music education since the "singing school" movement was introduced in the United States in 1717 by Lowell Mason. As America's first public school music educator, he advocated vocal instruction for all children (Phillips, 1992). The primary emphasis of Mason's singing method was the incorporation of specific exercises for developing singing skills (Aaron, 1990).

According to Phillips (1992) the use of a systematic approach for teaching developmental singing skills is often neglected in the elementary schools today, as children are more commonly taught by the song approach which focuses on teaching repertoire. In these cases, technical vocal study is relegated to the pedagogy of teen-agers and adults. In support of this idea, New Approaches to Music in the Elementary School, an elementary methods text book by Wheeler and Raebeck (1964), emphasizes teaching musical concepts through singing, motivating students to sing, and suggests forming a "sing club" to help the inaccurate singer. The text includes no instructions on such physical aspects of singing as posture, breathing, lifting the soft palate, or relaxation of the pharynx.

In contrast, the currently popular Silver, Burdett, and Ginn Music Education curriculum, The Music Connection (1996) contains basic instruction for singing techniques for each grade level. For example, the eighth-grade

edition includes nine pages of instruction which cover exercises to develop range, breathing, and posture, as well as information on the changing voice. Listed within specific songs in the fifth-grade edition are elements of vocal development which each song emphasizes, such as breathing, tone quality, breath control, and blend. The first-grade edition prompts the teacher to listen for such elements as beginning breath control when children are singing specific songs (1996).

Another popular approach is the Kodaly method, which emphasizes a cappella singing as a foundation of music education. Other tenets include use of high quality music, availability of music to all, not just the upper class, use of solfege, musical experiences early in life, teaching music sequences based on child development, emphasis of folk music, and music experience before music reading (Sinor, 1996). According to Sinor (1996), Kodaly's general principles have been adapted for use in many American music education classrooms.

In summary, a variety of methods for teaching singing skills are currently in use, resulting in inconsistent pedagogical approaches for singing in the United States. Phillips (1992) cited the problem that some students are learning only repertoire, with inadequate instruction in vocal technique. However, systematic methods for teaching singing skills are advocated through other approaches to teaching singing such as the Kodaly method and the Silver, Burdett, and Ginn curriculum, The Music Connection.

Statement of the Problem

Vocal Instruction

In spite of the fact that singing instruction has been a primary component of public education for over 150 years, much of the American population lacks the ability to sing tunefully. Inaccurate singing can be the result of (a) organic causes, i.e., retarded maturation, physical defects, and disease,

(b) psychological causes, i.e., poor pitch discrimination, poor pitch memory, and lack of confidence, and (c) limited vocal control due to a lack of breath support, lack of kinesthetic awareness in the vocal mechanism, inability to shift into the upper register, and/or straining (Phillips, 1992).

Fry (1948) also indicated that inaccurate singing may be the result of poor self-confidence. In order to develop confidence in any skill, however, a student must feel that he is prepared to perform. According to Bill McCloud, music education professor at Appalachian State University, changes in music education curricula may have resulted in children who lack confidence in singing. In assessing these changes over his career and lifetime, McCloud stated that teaching musical concepts may be taking precedence over singing in the general music class. McCloud concluded that we are producing better musicians, but not necessarily better singers. A natural consequence of this change is the continued presence of the singer who cannot match pitch (personal communication, March 24, 1997).

Despite a wide range of vocal abilities that exist among inaccurate singers, the term "monotone" has often been used by investigators to identify all uncertain singers (Aaron, 1990). Other terms used to identify the inaccurate singer include untuneful singer, uncertain singer, non-singer, poor pitch singer, problem singer, tune deaf, droner, and backward singer (Aaron, 1990). Joyner (1969) further defined varying degrees of inaccurate singing and described methods of remediation for each classification. This study will incorporate the term "inaccurate singer" defined by Aaron (1990) as the person who sings "off-pitch." The term "inaccurate singer" is broad enough to include all developmental phases of pitch accuracy, from the singer who is unable to match individual pitches or melodic patterns, to the singer who simply requires

instruction for expanding a small, but accurate range. In addition, references to specific pitches will use the scale which identifies "middle" C as C4.

According to the research literature, degrees of pitch inaccuracy exist on a continuum and may depend on age (Goetze and Horii, 1989). As with any skill, pitch-matching is not developed in a clearly defined sequence for all children (Atterbury and Silcox, 1993). Apfelstadt (1984) stated that singing involves hearing, remembering and reproducing tones which are combined as a complex skill and concluded that the ability to coordinate these elements occurs at various times for individual children.

Music teachers are frequently challenged to provide remedial training for singing during brief music classes, which often meet on a weekly basis. There are, however, efforts being made to find effective and efficient means for improving pitch accuracy among children. Jarjisian (1983) discovered that melodic instruction in both diatonic and pentatonic patterns produced greater pitch accuracy skills than instruction in one type of pattern exclusively. It is generally accepted that the interval of the descending minor third is the easiest interval pattern to be matched by beginning singers (Abbe, 1993; Nye and Nye, 1970; Raebeck and Wheeler, 1964). A sequence of tones is more easily matched than single pitches (Jones, 1979; Sletto, 1992), with ascending patterns more difficult than descending (Abbe, 1993). Sletto cited Sinor (1984/1985) in stating that 4-note patterns with step-wise motion and thirds are most easily matched. The use of descending patterns and glissandi were also found to facilitate pitch-matching by Jones (1979) and Joyner (1969).

Pitch range varies according to age. According to Nye and Nye (1970), C4 - G4 can be used as a beginning range for preschool and first-grade children. Most elementary music texts use the interval from C4 - D5, which comfortably fits the adult voice as well. The target range for children by their

sixth-grade year should be B-flat 3 - F5. However, inaccurate singers may remain in in the range from A3 - F4 (R. Nye and V. Nye, 1970).

Conflicting results were derived from research defining the interrelationship between pitch accuracy and pitch discrimination. Zwissler (1971), as cited by Sletto (1993), found a trend linking ability to sing and pitch perception in a group of first graders. However, when Geringer (1983) researched preschoolers and fourth graders, he found no correlation between the two components. Furthermore, Geringer stated "that pitch matching is at least partly a function of physical development, whereas pitch discrimination can be viewed as a function of discrimination learning" (p.98). The difference in age and therefore psychological development may account for the differences in the findings between the two studies, as "maturation and training may be necessary to develop an interrelationship"(p.98).

A number of researchers found that children frequently sing more accurately when singing alone, rather than in groups (Goetze and Horii, 1989; Lindh, 1993; and Joyner, 1969). On the contrary adults have been found to sing more accurately within a group (Vorce, 1964 as cited by Goetze and Horii, 1989).

Investigation of another factor thought to affect pitch accuracy, the context of accompaniment, was conducted by Atterbury and Silcox (1993) and Stauffer (1985). No significant effect on pitch accuracy skills was attributed to systematic training with piano accompaniment.

The best "instrument" to serve as a model for pitch-matching is the human voice, which can also demonstrate tone quality, resonance, breathing, and dynamics (Abbe, 1993). However, voice timbre and the potential octave displacement of the male voice are areas of concern for the music educator.

Sletto's (1992) investigation found that among soprano, falsetto, tenor and keyboard models, the soprano was most frequently matched, followed by the falsetto, then the keyboard and last, the tenor. On the contrary, similar research indicated that children conditioned to a male model respond accurately to it with greater frequency, with some of the students of a male general music teacher responding in a parallel organum style to the soprano model (Abbe, 1993). While piano is typically used as an instrumental model for pitch matching, R. Nye and V. Nye (1970) also recommend bells. Other possibilities include xylophone, synthesizer, tenor recorder, trumpet, flute, violin, or cello (Sletto, 1993).

Many researchers have found that boys tend to be less accurate singers than girls (Aaron, 1990; Goetze and Horii, 1989; Phillips, 1992; Stauffer, 1985). Aaron (1990) studied 109 children, in grades four through six (45 boys and 65 girls) and found 82% of the boys to be inaccurate singers, while only 59% of the girls tested were in the inaccurate category. These findings support statistics cited by Aaron (1990) that between 76% and 79% of inaccurate singers in previous studies were male (Bentley, 1968; Cary, 1949; Jones, 1979; Roberts and Davies, 1975). However, later research by Sletto (1992) and Abbe (1993) on the effects of various pitch models refuted this claim. Hermsen (1996), in a study of the effects of recorder instruction on pitch accuracy also found no significant difference in pitch accuracy skills by gender. Age/maturation is frequently a factor in pitch accuracy, as well. As children grow, their singing skills generally improve. (Abbe,1993; Forcucci, 1975; Goetze and Horii, 1989; Gould, 1969; Hermsen, 1996; Phillips, 1992; Sletto,1992).

Furthermore the age at which musical exposure and training begin may be critical for the natural development of pitch accuracy (Boyle and Penticoff, 1989; Gould, 1969; Phillips, 1992; Stene, 1969; Welch, 1988; Yoder, 1997). Imberty

(1981), as cited by Boyle and Penticoff (1989) reported that a "ceiling effect" exists around the age of 12 years in regard to developing tonality perception, an issue related to pitch accuracy. He contended that tonal perception is a process of acculturation, but beyond the age of 12 years formal training is necessary to continue the development of tonal perception skills (cited in Boyle and Penticoff,1989). Phillips (1992) made the assertion that the time from 18 months to three years is critical for musical growth, since a repertoire of tonal patterns and tonal memory is being developed during this age span.

In conclusion, inaccurate singing may be the result of organic, psychological, or kinesthetic problems, and may be compounded by low self-confidence. Due to the fact that singing is a complex skill,involving hearing, remembering, and reproducing tones, it has been demonstrated that pitch matching is not developed in a clearly defined sequence. The research literature indicates that using both diatonic and pentatonic patterns, stressing the descending minor third interval, and using sequences of tones to be matched as opposed to a single tone all contribute to greater success in pitch matching. Furthermore, inconsistency in the relationship of pitch perception to pitch matching is demonstrated in the literature. Zwissler (1971) found a trend linking ability to sing and pitch perception, whereas Geringer (1983) found no such relationship. According to Goetze and Horii (1989) children appear to sing more accurately alone, while adults' pitch accuracy increases when singing in groups. Researchers also indicate that the human voice is the best model to use for pitch matching. However, conditioning to a particular model may have an impact on pitch matching ability with models unlike the voice of the subject. Finally, the research literature also indicates that early exposure and musical training may be critical to establishing pitch accuracy skills.

Suzuki Method

The above premises regarding early exposure to music along with early training in basic vocal technique are consistent with the "Talent Education" philosophy of Shinichi Suzuki. The basic foundations of the Suzuki approach as they apply to music instruction rely on repeated listening, parental involvement and early establishment of technique. A general overview of the Suzuki philosophy is necessary to understand the "Suzuki Method." (Yuet-Din Lo, 1993)

Dr. Suzuki indicated in his book, Nurtured by Love that he strongly believed that the human being is a product of his environment.

> We don't have to look for specific innate abilities or talents. It is a superior environment that has the greatest effect in creating superior abilities....Abilities are born and developed by the working of the vital forces of the organism as it strives to live and adapt to its environment right in the beginning. Therefore the only superior quality a child can have at birth is the ability to adapt itself with more speed and sensitivity to its environment than others. (p 13)

From his view on environmental theories, Suzuki deduced that musical "talent" is actually the result of the influence of environment (Yuet-Din Lo, 1993).

> Talent is no accident of birth....There is no telling what heights children can attain if we educate them properly right after birth.... When looking at a newborn baby, absolutely nobody can say, 'This child will be a talented musician,' or, 'This child will be a talented literary person.' (p.ix)

The vital connection between the influence of environment and the "Suzuki Method" is in the universal ability of children to learn to speak their mother tongue (Yuet-Din Lo, 1993):

> When the root of this idea occurred to me...,I was overwhelmed by the fact that all children in Japan speak Japanese easily....The best method in the world is hidden within the mother tongue education....I decided, 'If a child speaks his language fluently, he has developmental possibilities. Other abilities should therefore develop according to the way he is raised."... However, education of Japanese does not involve only learning Japanese in bits and pieces. It involves developing the ability to learn a language at the same time. Until now, the majority of education methods have concentrated merely upon teaching in bits and pieces instead of nurturing talent....Every one has a sprout of talent. Developing that sprout into a wonderful ability depends on how it is cultivated. (p.1)

The Suzuki philosophy of music teaching differs from traditional methods in a number of ways, most of which are attributable to Dr. Suzuki's holistic approach to nurturing a child's ability to acquire musical skills. He asserts that all aspects of music teaching—listening, technique, creativity, tonal memory, ear training, expression, and performance—should be introduced to the child early in life. Suzuki students often begin lessons prior to age three, compared to public school students who traditionally begin their music education at age five. Another primary difference when compared to traditional music approaches is the presence of a parent at all lessons and during daily practice. In addition, the parent is encouraged to develop at least basic technical skills on the instrument in order to monitor his child's practice and demonstrate proper technique.

Internalization of musicality is promoted in the Suzuki method through repetition of pieces previously learned. A Suzuki student is never "finished" with a piece. It is commonplace at group lessons or institutes for all students at all levels to play the elementary pieces together. Weekly practice assignments

consistently include pieces to be reviewed (personal communication, Cheryl Weldon, March 15, 1997).

Another critical and controversial departure from traditional methods is that Suzuki students begin learning music by rote, as opposed to being introduced to music notation initially, an obvious manifestation of the mother tongue approach to education. This enables the teacher to instill excellent technical skills, while the child develops the listening skills necessary to discern dissonance/consonance, detect a beautiful tone, and recognize dynamic variations. Notational reading activities may begin at various points in each child's study, depending on age. In general, it is recommended that students begin reading activities no later than the commencement of study in book four of the Suzuki Method for piano (Elaine Edwards, personal communication, August, 1996). At this level the child will have developed the technical and listening skills necessary to begin study of such repertoire as the familiar Beethoven Sonata Opus 49, No. 2. Reading instruction may start with simple rhythm flash card exercises for the very young, or for the older student, with sight-reading literature.

In order to accomplish such a large amount of rote learning, the student must spend several hours a week listening to high-quality performances of the pieces he is learning. Suzuki teachers have called listening the heart of the Suzuki Method (Bath, 1994). The purposes for listening as they relate to the Suzuki Method of music teaching are (a) rote learning, i.e. use of the "mother-tongue" phenomenon for musical imitation; (b) exposure of young children to music through audio/visual technology; (c) possibility for early technical study; and (d) motivation.

In summary, the Suzuki Method is based on a philosophy of "Talent Education," developed by its founder, Shinichi Suzuki. The foundations of this

philosophy rely on repeated listening, parental involvement, and establishing good technique. According to Dr. Suzuki, innate ability is not necessary to develop superior musical abilities. It is through exposure and early intervention that children acquire such abilities. This philosophy of education to develop talent generates differences between Suzuki teaching methods and traditional methods, including the presence of parents at all lessons and practice sessions; repetition of old repertoire; beginning lessons as early as age two; delaying reading skills to develop technique, listening ability, and musicality; and listening repeatedly to pieces being learned. These differences in philosophocal approach often produce highly motivated and accomplished students.

Need for the Study

While many creative approaches for training the inaccurate singer in a regular class setting are suggested in the literature, music educators frequently indicate that remedial work with inaccurate singers is best conducted on an individual or small group basis (Forcucci, 1975; Jones, 1979; Joyner, 1969; Lindh, 1993; Nye and Nye, 1970; Phillips, 1992; Roberts and Davies, 1975; Stene, 1969). Most experienced music educators would agree, however, that individual teaching may be impractical in the school setting. Gould (1969) also stated that isolation of the problem singer may be traumatic and further alienate the child. In addition, he concluded that group activities improve the intonation of every child along the pitch accuracy continuum, not just the most severely inaccurate singers. Researchers, therefore, must continue to seek effective ways to improve individual students' singing through group activities.

Purpose of the Study

Suzuki principles have been successfully applied to instrumental music programs for years; however, minimal research has been conducted to

determine if these same principles can be applied successfully to vocal instruction. The purpose of this study will be to determine the effect of repeated listenings to songs being learned by first-graders on pitch accuracy.

Primary Hypothesis

1. There will be no significant differences between posttest means of pitch accuracy scores of first-graders who receive repeated listenings during regular classroom time to a song being learned in music class and those who receive the same instruction in music class, but no additional listenings.

Secondary Hypothesis

1. There will be no significant differences between posttest means of pitch accuracy scores attributed to gender.

Summary

There is much empirical research literature regarding the inaccurate singer. However, methods for improving pitch accuracy often require individual teaching. The impracticality of individual teaching for the public school music teacher necessitates the development of more effective methods for group instruction to improve pitch accuracy. The primary research objective of this study is to determine if the Suzuki principle of repeated listening within a group setting improves pitch accuracy skills.

CHAPTER II

Review of Literature

Introduction

In the previous chapter it was stated that much of the population in the United States remains unable to sing tunefully, despite efforts made in public education to eradicate the problem. The causes and treatments of pitch inaccuracy were also addressed. The purpose of this chapter will be to summarize research in the following areas regarding inaccurate singers: skills necessary for singing, pitch discrimination as it relates to pitch accuracy, perception of tonality, individual versus group singing, type of accompaniment, age, gender, and attitudes toward singing. Specific techniques for teaching and remediation will be further examined as well.

Singing Skills

Abbe (1993) presented a concise description of the complex skill of singing as it relates to the cognitive, psychomotor, and affective domains of learning. The psychomotor domain involves control of the physical elements of singing, i.e., articulation, breathing, phonation, and resonation. Pitch discrimination and tonal recall comprise the cognitive domain, and the affective domain involves the desire to express oneself through singing. Abbe stated that of the three domains, the affective may be the most important, since the other two are difficult to attain without motivation. This theory generally parallels Joyner's (1969) theory of skills necessary for singing. According to Joyner, a singer must be able to (a) distinguish between individual pitches as they comprise a melodic line (cognitive); (b) recall the organization of pitches to prepare for the

next phrase (cognitive); and (c) respond immediately and accurately with a vocal instrument capable of reproducing the proscribed melody (psychomotor).

Apfelstadt (1988) defined three crucial categories of proficiency for pitch accuracy in performance. "Hearing" was defined as the physical ability of the ear to perceive the model. The second category was defined as "remembering;" which included tonal memory, repetition, and learned models. The final category is that of "reproduction," which includes control of the physical mechanism in order to duplicate the mental concept of individual tones and their composite patterns.

In his 1969 study on developing specialized programs for singing in the elementary school, Gould (1969) presented two basic principles of singing. The first was that a child must learn to hear, judge, and control his own voice. The second principle indicated that the child must also recognize the sensation of singing in unison with other voice(s)/instrument(s). Furthermore, Gould (1969) presented six musical elements that a child must understand in order to sing: (a) the singing voice and the motor skill of sustaining vocal sounds contrasted with the staccato sounds of speech, (b) the difference between high sounds and low sounds and the motor skill of controlling the pitch levels of the voice in speech and song, (c) the sound of a musical tone and the mental skill of translating the tone heard by the ear into a tonal image, (d) the melodic relationship and the mental skill of moving from one tonal image to another, (e) unison and the combined mental and motor skills of matching the vocal mechanism and the tonal image, and (f) the vocal quality of the true singing voice and the combined mental and motor skills of producing and manipulating this singing voice with or without the mental motor act of adding words.

Researchers agree that singing is a complex skill involving all three domains of learning. Gould found that children must be able to hear their own

voices to become accurate singers. Along with Joyner, Gould cited concepts which must by understood in order to sing. Apfelstadt categorized components of pitch accuracy skill to illustrate the processes necessary for accurate singing.

Interrelationship of Pitch Discrimination and Pitch Accuracy

In a study by Geringer (1983), the relationship of pitch discrimination and pitch accuracy among a group of preschool (n = 72) and fourth-grade children (n =72) was examined. After being administered a pitch discrimination pretest determining if 12 pairs of tones were the same or different, the subjects were divided into 3 ability groups (high, middle and low) based on their pretest scores. Each subject was then posttested for pitch matching ability. A significant difference ($p < .01$) in pitch-matching ability by age was found, with the fourth graders having better pitch matching skills, but no correlation existed between pitch discrimination abilities and pitch accuracy scores. A moderate correlation, however, was revealed between the two measures for high-ability fourth graders (r=.61). Geringer concluded that it is possible that pitch matching and pitch discrimination are two separate abilities that develop independently of each other, or that maturation and exposure are necessary to build an interrelationship.

To determine if melodic perception instruction would affect pitch discrimination and vocal accuracy, Apfelstadt (1984) tested three groups of kindergarten students (N = 61). The Primary Measures of Music Audiation (PMMA), Boardman Test of Vocal Accuracy , and a rote singing test were used to pre- and posttest subjects for pitch discrimination ability. One experimental group (E1) received vocal instruction through kinesthetic and visual means of enhancing melodic perception. The second experimental group (E2) received instruction that reinforced only the duration of sounds and pitch pattern, and the control group (C) received a non-conceptual mode of instruction. No emphasis

on specific aural skills was given. After 11 weeks of treatment, posttest results indicated that no significant change in pitch discrimination existed in any group. However, there were significant differences ($p < .05$) in posttest scores on pitch pattern accuracy between E1 and C, E2 and C, with E1 and E2 scoring significantly better than C. No significant differences were found between the two experimental groups on either measure. In conclusion, Apfelstadt stated that the PMMA does not measure awareness of melodic direction, a vital part of her study, but only distinction of pitch. Additionally, the emphasis of melodic rhythm for E2 may have been a factor in increasing the subjects' scores for vocal accuracy. Finally, the fact that the youngest subjects comprised E2 indicates a possibility that developmental gains may have been a determining factor in results. The researcher recommended that future studies seek to remedy these factors.

Using a different instrument, the Bentley Measures of Musical Abilities, Joyner (1969) found a significant difference in the pitch accuracy scores of subjects with deficits in pitch discrimination and tonal memory skills, and subjects more proficient in these skills. Testing 32 teacher-identified monotones, he found significant differences in the means of the normal singers and real monotones at the .05 level. These results support Bentley's findings that inaccurate singers are deficient in both pitch discrimination and tonal memory. Joyner's conclusions revealed the possibility that pitch discrimination skills may be improved by increasing vocal coordination and pitch matching skills, rather than being a prerequisite to those skills.

In summary, although pitch discrimination and pitch accuracy would seem to be closely related, Geringer, utilizing the PMMA, found no correlation between the two variables in preschoolers and low to average ability fourth graders. On the contrary, Joyner found significant differences ($p < .05$) in mean

scores on the Bentley Measures of Musical Abilities between accurate and inaccurate singers. In addition, Apfelstadt found melodic perception instruction to have no significant effect on pitch discrimination.

Perception of Tonality, Pitch Accuracy, and Range

Maintenance of tonality, pitch accuracy, and vocal range among 93 preschool children ages 3-5 years was studied by Flowers and Dunne-Sousa (1990). Each subject was tested on all three variables while singing a self-chosen song, a taught song, and reproducing pitch patterns. Forty-seven percent of the children in the study modulated while performing their self-chosen songs; many modulations occurred in the taught song as well. In the low range, modulations seemed to be the result of physical necessity, whereas in the upper range, the children appeared to choose not to explore the upper voice. Children were more likely to use the upper range, however, when echoing pitch patterns. Consistent with past research, subjects more accurately approximated melodic contours than actual pitches. The researcher suggested that responding to brief patterns may be easier than the self-monitoring required to sing an entire song, although using higher pitches in echoing exercises may promote exploration of the upper range. Ultimately, pitch pattern accuracy and maintenance of tonality appeared to be unrelated.

In a study involving elementary school children (N=279), Boyle and Penticoff (1989) administered a variation of a tonality perception test developed by Thackray (1976). Subjects' mean posttest scores indicated that tonality perception improved at significantly observable rates ($p < .05$) every two grade levels, through the primary grades of K-4. No significant differences in mean scores between grade levels was observed beyond grade four. These scores indicate a plateau about two years before the plateau observed by Imberty (as cited by Boyle and Penticoff, 1989). Regardless of the age onset of the plateau,

subjects from grades four, five, and six accurately identified a tonal center for 90% of familiar melodies and 85% of unfamiliar melodies.

In summary, modulation in rote singing was found to be common among three- to five-year olds, by Flowers and Dunne-Sousa (1990), with modulation being related to maintenance of a comfortable range. Boyle and Penticoff (1989) confirmed Petzold's conclusion (1963) that a plateau in tonality perception occurs in the elementary grades.

Individual Singing vs. Group Singing

Participation in group singing is a primary component of music education from elementary school to the college level. Group singing is motivational and practical, nonetheless Goetze and Horii (1989) found evidence that children sing more accurately alone than in a group.

Subjects for this study were 100 children from kindergarten, first-, and third-grade classes. Students were tested in groups of three for pitch accuracy while singing "Pinto Pony." Pretests began with a practice test of group singing, followed by individual singing tests and culminating with the actual group singing test. Each child was fitted with a microphone, and group singing tests were tape recorded with each child's voice on a separate track for clarity in evaluation. Mean scores of pitch inaccuracies during group singing ($\underline{m}$ = 241.15) were significantly higher ($\underline{p} > .05$) than for individual singing ($\underline{m}$ = 173.02). Mean scores for individual and group singing for all grade levels and both genders reflect this relationship between the group and individual singing tests. Mean scores of pitch inaccuracies for both group and individual singing decreased as subjects' ages increased, with the greatest drop from kindergarten to first grade (263.5 to 130.69 for individual; 337.45 to 227.55 for group). Mean scores of inaccuracies by gender revealed that while girls increased in inaccuracies from individual (163.01) to group (191.84) singing,

the increase in inaccuracies from individual (183.17) to group (292.28) singing was much greater for boys.

It is possible that the children who could not sing accurately within a group were unable to respond to the simultaneous stimuli of their own voices and those of the group around them. The researchers stated that this apparent acquisition of individual singing skills prior to group singing skills suggested that individual remediation may be most helpful for the inaccurate singer.

The Effect of Types of Accompaniment on Pitch Accuracy

The effects of various types of vocal harmonic accompaniments on the pitch accuracy of 25 sopranos from university choral ensembles were researched by Sterling (1985). A Pitch Master, an instrument which compares vocal pitches with those on a reference tape, was used to allow the subjects to listen to three unaccompanied melodies, followed by the same melodies with accompanying vocal harmonies in traditional, quartal, dissonant, chromatic, and extended chord styles. Since the Pitch Master provides feedback to the singer, it was possible for the subjects to then sing the melodies and be rated by the Pitch Master on pitch accuracy. The subjects were asked to perform the melodies unaccompanied until they achieved a score of within five points of the total possible score. Following this task, subjects were given one opportunity to sing each melody with each style of accompaniment chosen at random. Mean scores for performances of melody 1 (ascending) out of a possible score of 42, ranged from 25.96 with dissonant harmonies, to 32.12 with traditional harmonies. Means for melody 2 (descending) out of a possible score of 46 ranged from 27, with chordal extensions to 31.24, with dissonant accompaniment. Finally, melody 3, which was static, produced means of 33.52 with chordal extensions, to 38.24 with chromatic accompaniment out of a possible 55. The null hypothesis that different choral harmonic

accompaniments would not have an effect on a singer's vocal pitch accuracy was rejected at the .01 level of significance for melodies 1 and 2, and at the .05 level for melody 3. In addition, traditional tonal harmonic accompaniment resulted in more accurate singing of the melody for two of the three melodies. Sterling (1985) concluded that the type of harmonic vocal accompaniment influences pitch accuracy on melodies previously learned, and traditional harmonic accompaniments produce greater pitch accuracy than quartal, dissonant, chromatic, and extended chord accompaniments.

Atterbury and Silcox (1993) examined the long-term effects of piano accompaniment versus no piano accompaniment on young children's rote singing abilities. At the beginning of the academic year, kindergartners (N = 205) were taught the song "Pinto Pony" and were individually pretested for pitch accuracy while singing it. The subjects were then divided into an experimental group (n = 96) which received no piano accompaniment while singing in their music classes over the course of the school year. The singing experiences of the control group (n = 109) were accompanied by piano. At the conclusion of the treatment period, the students were posttested again singing "Pinto Pony." Pre- and posttests were evaluated using a modified version of a five-point scale by Rutkowski (Phillips, 1992):

1. presinger: does not sing, but chants the text;
2. uncertain singer: sustains tones, uses both speaking and singing voice, when singing uses a limited range of about a third;
3. partial singer: sings some phrases correctly, but not entire song;
4. singer: sings entire song in one key. (Atterbury and Silcox, p. 43)

Both pre- and posttests means were evaluated for interrater reliability by Atterbury and Silcox (1993) on two separate occasions. Interrater reliability values were r = .747 for the pretest and r = .859 for the posttest. Gordon's

PMMA was also administered at the conclusion of the school year. Efforts to conduct the PMMA at the beginning of the year were abandoned because many of the subjects were incapable of completing the required tasks within the given time limit.

An ANCOVA using pre- and posttest song score means indicated no significant difference between the experimental and control groups on song performance following treatment. Analysis of the PMMA scores between the two groups also yielded no significant difference. However, when subjects were grouped by ability according to PMMA results, a significant difference at the .05 level was found between posttest mean song scores of the high ability group and the average and low ability groups. Atterbury and Silcox (1993) concluded that harmonic piano accompaniment in music classes had no effect on the singing abilitiy of kindergartners. The researchers pointed out, however, that the narrow range of the test could have confounded the results. They suggested that future studies evaluate phrases of songs rather than entire songs.

In summary, Sterling's (1985) research indicated that adult singers' pitch accuracy may be affected by the style of harmonic accompaniment present. However, the study by Atterbury and Silcox on the effect of simple piano accompaniment on kindergarten subjects showed no significant change in singing ability.

Gender and Age

According to Phillips (1992), gender and age affect singing ability: "(a) there are more boys who sing inaccurately than girls, and (b) the number of inaccurate singers decreases with age" (p. 32). In their study of group vs. individual singing in kindergartners, first-, and third-graders, Goetze and Horii (1989) concurred with Phillips when they found that when measuring pitch

inaccuracy, boys had a greater mean score of inaccuracies on individual singing than girls, and a 50% greater mean score of inaccuracies in group singing. Aaron (1990) found that instruction in the areas of posture correction, physical coordination, breath management, and general use of the body as an instrument to be more effective for improving vocal pitch accuracy in boys than in girls, with highly inaccurate boys improving the most. Girls responded as well to a program of vocal coordination instruction as to a general program of vocal instruction.

Nonetheless, in two studies on the effects of various vocal models on children's pitch accuracy by Sletto(1992), and Abbe (1993), no significant gender difference was found on pitch accuracy skills. Abbe cited the findings of Jersild and Bienstock (1934), Drexler (1938), Pedersen and Pedersen (1970), Wassum (1979), Apfelstadt (1984), Sinor (1984), and Moore (1991) that concur with his findings.

In summary, it is accepted by some experts that females are more accurate singers than males. Research related by Goetze and Horii (1989) concurred with this statement. However, the recent research of Sletto (1992) and Abbe (1993) contradicted this statement.

Less controversy exists in regard to the effect of age on pitch accuracy, when compared to the effect of gender. An opinion survey included in Gould's (1969) Developing Specialized Programs for Singing in the Elementary School demonstrateded that teachers reported percentages of problem singers as follows: 1st grade - 34.6%; 2nd grade - 24.2%; 3rd grade - 17.8%; 4th grade - 12.9 %; 5th grade - 11.8%; 6th grade - 11.0 % (p.14). The percentages include both males and females. Respondents were also asked to describe the nature of the singing problem. Responses, not specific to certain ages, included, too low, too high, sings only one note, combination of the above, and

psychologically inhibited. While these data can only be viewed as opinion, they parallel the empircally derived findings of other researchers regarding the effect of age on pitch accuracy.

Goetze and Horii (1989) again concur with Phillips in their summary of findings on the group vs. individual singing study which revealed that, in general, more third graders sang accurately than first graders. Abbe's results (1993) also reinforce the premise that vocal accuracy improves with maturation, since in his study fourth graders' composite pitch matching scores were 50% higher when compared with those of first graders. In another study on the effects of various vocal models on pitch accuracy in grades one through six, Sletto grouped subjects by grade groups rather than grade levels. Grades one and two comprised Level I, with grades three and four labeled Level II. Grades five and six were Level III. Invariably, Level II outscored both Levels I and III. Sletto suggested two possible reasons for this unanticipated outcome: Levels I and II had been taught pitch matching and vocal development by a Kodaly-trained teacher since grade one. In addition, just prior to the study, Level III students had received a year of music instruction involving minimal singing with much paperwork. Sletto suggested that perhaps the combination of these two factors may have had an effect on the results.

Nevertheless, at least for the primary grades, there is evidence that maturation has a positive effect on pitch matching skills. Sletto's findings indicated that type of music instruction can affect pitch accuracy, to the extent that the importance of the age factor is diminished.

Attitudes toward singing

In order to build a strong choral program, music educators are often challenged to motivate children to sing. This brings to mind the question, "Are children who possess good singing skills automatically motivated to sing?"

Mizener (1993) attempted to compare children's attitudes toward singing and choir participation to their assessed singing skills. Third- through sixth-graders (N = 542) answered items on a previously piloted questionnaire involving five categories of information: (a) singing interest, (b) choir participation, (c) classroom singing activities, (d) out-of-school singing experience, and (e) self-perception of singing skill. Following completion of the questionnaire, 123 students were randomly selected for a tape-recorded evaluation of vocal accuracy and singing skills. The subjects were asked to sing two familiar songs, "Jingle Bells" and another self-chosen folk song.

To score singing accuracy, a seven-point scale based on criteria used by Smith (1973) and Flowers and Dunne-Sousa (1988) was devised. Scores ranged from 7, indicating maintaining the same tonal center from beginning to end; to 1, indicating a lack of any tonal center, or chanting of text.

Positive responses to the question, "Do you like to sing?" declined with each succeeding grade level. Percentages ranged from 86% of third-grade subjects answering the question in the affirmative to only 67% in the sixth grade. Over all, 64% of male subjects indicated they like to sing, while 87% of female subjects responded positively. However, when questioned about their desire to sing in a choir, the students positive answers ranged from 53% in third grade to 42% in sixth grade. Thirty-three percent of boys responded positively to this question, with 55% of girls answering in the affirmative.

Students' responses indicated that they preferred not to use songbooks in music classes, but 64-87% indicated that the songs in their books were comfortable to sing. Only 49% of third graders believed themselves to be good singers, with a 50% drop in that rate, to only 24% of sixth-graders affirming their singing ability.

Evaluation of singing ability was related to three factors: pitch accuracy, accurate reproduction of melody on the best performance of "Jingle Bells," and accurate reproduction of the melody in the second song. Ironically, the singing skills tests revealed no correlation between self-perceived singing ability and actual singing skill. Nor was there a correlation between self-perceived singing ability and enjoyment of singing or desire to join a choir.

Mizener concluded that using male singers as role models could be helpful in encouraging boys to continue singing, and that music educators need to find innovative ways to maintain students' interest in singing as they age.

Vocal Pedagogy Techniques and Remediation

It is the rare choir director who has never had the experience of welcoming a new member to choir, only to be dismayed at the fact that the child could not sing accurately. However, research has revealed some helpful techniques for pitch accuracy remediation.

Vocal Coordination Instruction

In a recent study by Aaron (1990), students from grades four, five, and six (N = 109) were tested for singing accuracy. Seventy-five subjects were identified as inaccurate singers by pretesting all students on song phrases previously learned. Treatment lasted 20 weeks, with two weeks at the beginning and end of the study for pre- and posttesting. Identified inaccurate singers in both the experimental and control groups received 10 minutes of vocal instruction during each music class, which met twice weekly.

Group instruction was used for both groups, with the experimental group receiving vocal coordination instruction, which "included treatment in the areas of physical coordination, posture, breathing, phonation, resonant tone production, and flexibility across the register 'break'" (p.96). Both groups were instructed in pitch shaping (singing "higher" or "lower" to match a pitch),

additional song practice, and vocalise singing. Vocalises for both groups were scalar and triadic and transposed to different pitch levels. While the control group received traditional vocal instruction in repertoire and vocalises, they were not instructed in the areas of proper posture, respiration, speech-to-song activities, or use of the throat and and oral cavity as resonators.

The physical coordination exercises for the experimental group included movements to enhance the subjects' awareness of their bodies as musical instruments, such as "stretching, bending, and shaking" (p. 97). Posture correction was also a part of respiration instruction. Aaron pointed out that correct breathing cannot occur without proper posture. "Elevation of the rib cage was encouraged, as was the 'spinal stretch' or lifting the body out of the hips" (p.97). Instruction in contraction and relaxation of the diaphragm encouraged subjects to feel the natural breathing cycle. In addition, development of breath management skills through the slow emission of air was a part of the respiration training. Speech-to-song activities were used in phonation instruction, as were exercises on various vowel sounds. According to Aaron, speech-to-song activities are especially appropriate for beginning singers, since they require less control of the breathing mechanism.

Resonant tone production was promoted through adding specific pitches to the speech-to-song exercises. The use of pharynx and mouth as resonators was explored. Flexibility across the register break was promoted through resonation exercises by encouraging students to control the vocal mechanism in all registers (above, below, and between C4 and C5).

Study results demonstrated that vocal coordination instruction improved the vocal pitch accuracy and the vocal range of inaccurate singers with significant differences at the .05 level between the pre-and posttest mean

scores for subjects. However, the treatment proved to have no effect on pitch discrimination or tonal memory.

Specific attention to breathing coordination was studied by Lindh (1993). She researched the effect of proper breathing instruction on the pitch accuracy of five inaccurate male singers from the third and fourth grades. The students were designated for the study based on their performance of "Happy Birthday" beginning on a note of their own choosing. Young's evaluation scale was used to score pre- and posttests (as cited by Lindh,1993):

1. Speaker-singers - singers who have never experienced the difference between their speaking and singing voices and attempt to sing in their speaking voices
2. Non-directional singers - singers who have no consistent melodic direction, or seem to wander aimlessly
3. Directional-singer - singers with undeveloped aural perception, causing them to follow the melodic contour, while being unable to sing the correct intervals in tune
4. Transposing-singer - singers who transpose the melody fairly correctly to a more comfortable key
5. Certain-singer - singers who sing at the proper level and in tune most of the time. (p. 44)

Treatment lasted for five weeks, with twice weekly 10-minute sessions of training. Activities to improve posture and vowel formation were also taught. The breathing techniques used in the study combined the costal and diaphragmatic techniques as described by Vennard (1968). Documentation of physical adjustment as it correlated to pitch accuracy was accomplished by evaluating the following criteria: (a) chest expansion, with inhalation measured by a tape measure held around the solar plexis about level with the lower ribs, (b) timing

of controlled exhalation on a hissing sound, (c) evaluation after three weeks of treatment of pitch accuracy in an a cappella singing of "Happy Birthday" beginning on a comfortable note of each boy's choosing, and (d) categorization of each boy's pitch accuracy at the first session and again at the last session according to Young as cited by Lindh (1993). Imagery was encouraged through the use of such visual aids as a roll of ribbon to visualize unbroken, constant exhalation, a bottle to illustrate filling and emptying the body of air, a light bulb for describing the open throat/lifted palate; and a pinwheel to measure control of exhalation.

Subjects were encouraged to feel buoyant posture with "heavy hands" at the sides and with knees relaxed. Bean bags placed on the shoulders were used to remind subjects to keep shoulders free of tension. The subjects evaluated their stature in a mirror to check for proper breathing. Hissing exercises were timed with a stop watch, while rib expansion was measured with a measuring tape to show progress in quantity of air inhaled. Following preparatory breathing exercises such as candle blowing exercises and counting while exhaling, the subjects were asked first to sing the descending minor third using the syllables "yoo-hoo." As progress was made, longer patterns with a variety of intervals were taught. Other processes used to maintain relaxation and economic use of breath while singing included blowing soap bubbles and walking while singing. To experience function of the diaphragm, students learned a marcato echo activity on the word, "too". Length of hissing time varied from day to day and by subject, but all demonstrated at least some increase in rib cage expansion. Three boys achieved improvement in pitch accuracy from the non-directional singer category to the directional singer category, with the remaining two boys moving from the directional singer to the certain singer category. Lindh concluded that the subjects' improvement

indicated that instruction in breathing skills may improve singing ability; however, the study should be replicated with a larger number of subjects.

Joyner's (1969) study was conducted to "supply information to the class singing teacher that will help him deal with the 'monotone' problem with maximum speed and effectiveness" (p. 115). Thirty-two teacher-identified "monotones" from a boys' school were tested for participation in the study. The subjects were asked to sing the British National Anthem first in the key of G major, and again in a lower key, B-flat major. A score of "A" indicated no major pitch or errors of departures from the melodic outline, "B" indicated a performance generally erratic in pitch, in spite of moments of tunefulness, and "C" designated a performance with no melodic outline or pitch accuracy. Joyner's results for the performances in the two keys were as follows. In G major, six subjects received grade A, eight subjects received grade B, and 18 received grade C. In B-flat major, 15 subjects received grade A, nine subjects received grade B, and eight subjects received grade C (p.115).

Based on the results of this initial test, Joyner classified the singers in this manner:

> Normal singers: six subjects who were able to sing in tune at both pitches
> Grade A Monotones: 10 subjects who were tuneful at low pitches, but untuneful in the usual one.
> Grade B Monotones: eight subjects who were erratic at both pitches, slightly better at the low one.
> Grade C Monotones: eight subjects who were always completely untuneful. (p.117)

Joyner classified Grades B and C as <u>real monotones</u>.

Voice production testing with the subjects singing scales and a self-chosen song revealed major deficiencies in ability to negotiate a "break" from G4 to A4. The real monotones experienced a drastic change at this point, causing their voices to collapse at or near these pitches. The grade A monotones were able to surpass these pitches only with great physical strain. The remaining six monotones experienced some degree of difficulty in this area, especially if singing loudly.

A direct relationship between lack of vocal coordination and pitch inaccuracy was inferred by Joyner from his observations of these subjects. He suggested two possible theories as to this relationship:

> The physical sensations involved in singing with a normal voice production are clearly felt and sufficiently finely balanced to vary from note to note. Various writers hold that kinesthetic sensations play an indispensable part in the recall of musical material.... In the same way physical sensations can also aid the comparison of two different pitches. Some writers think that laryngeal adjustment accompany even sub vocalization of musical material. The first theory assumes that the real monotone is cursed with an unusually inflexible laryngeal mechanism, or lacks the power of making normal use of it....(As a result, he lacks) a reliable method of checking or reinforcing the correctness of his initial attempts to sing in tune. He would be prevented from building up a repertoire of melodic configurations or developing a tonal memory. The second possibility is that the child who starts with comparative deficiencies in pitch discrimination and tonal memory may be little inclined or even unable to exercise his voice over a wide pitch range. His vocal apparatus would then remain undeveloped with respect to

singing due to lack of practice. This, in turn, might further inhibit his mental processes, thus producing a deadlock. (p.122)

In researching remedial techniques, Joyner worked with eight of the designated real monotones. He outlined his procedures in training sessions with one subject, an 11-year-old boy. Twenty sessions were conducted in an attempt to teach the subject to match the pitch C4, after which Joyner concluded that it was necessary to address the subjects lack of control over vocal attack and lack of kinesthetic awareness. Beginning exercises included:

1. opening the mouth as wide as possible, and resting the tongue on the floor of the mouth, checking with a mirror for opening of the throat and resonating space;
2. using the lower lungs to conserve breath and to oppose the outward flow of breath through extension of the rib cage, providing natural support for the voice and encouraging jaw, neck and throat muscles to relax;
3. Consciously directing the sound forward by raising the upper lip and singing a very sharp "ee" sound while holding the nose. (p. 113)

Around the fifth training session, the subject began producing better quality sounds. Following establishment of this improved vocal production, a new attempt at matching C4 was made. The subject was gradually able to produce the tone at will and move to D4 using a glissando technique. Through the use of glissandi, the subject negotiated the pitches C4 to a P5 above. Eventually a normal legato replaced the glissando, and vocal production, while still comparatively weak, had improved.

In summation, Joyner emphasized a parallel improvement of tonal recall with improvement training in vocal production. He suggested that direct training in the areas of pitch discrimination and pitch accuracy may be less effective

when the vocal instrument is unresponsive. Joyner examined 72 other real monotones, the majority exhibiting similar characteristics.

In remedial training with the Grade A monotones, Joyner found that their partial pitch inaccuracy was due to faulty coordination of the vocal instrument. These subjects always knew when they were singing untunefully, and testing revealed that they were able to recall tonal configurations. Similar exercises to those used in training of the real monotones were used with this group, but ranges and intervals were enlarged. In closing, Joyner pointed out the impracticality for the music teacher of conducting such remediation sessions, reiterating the need to begin group instruction of children in vocal production at an early age.

In summary, kinesthetic awareness appears to be an important component of accurate singing. Aaron, Lindh, and Joyner revealed a positive effect of vocal/physical coordination instruction on singing ability.

Pitch Pattern Instruction

In a study of six first-grade classes, Jarjisian (1983) attempted to determine the effects of diatonic and/or pentatonic pitch pattern instruction, musical aptitude and socioeconomic status on rote-singing achievement. Following the administration of the PMMA (Gordon, 1979) as a pretest, three first-grade classes (N = 96) at two different schools; one a black public school, and the other, a white archdiocesan school, received regular music instruction. Over the four-month treatment period, at each school one class (n = 16) received singing instruction with both pentatonic and diatonic patterns; another class (n = 16) received diatonic instruction only, and the other (n = 16) received pentatonic instruction only. The pentatonic patterns used were based on the Kodaly approach, with diatonic patterns being selected from Gordon's taxonomy

(1981). The combination groups were taught half of each of the patterns used in the other classes.

At the close of the treatment period for a posttest measure, each child was tape recorded singing four songs learned during the treatment period, two diatonic and two pentatonic. The following Likert rating scale was used to evaluate performances for pitch accuracy: "1 = use of singing voice, 2 = maintenance of pitch center or general sense of melodic direction (directional singing), 3 = maintenance of pitch center and general sense of melodic direction, 4 = accuracy in singing adjacent intervals or leaps, 5 = accuracy in singing intervals and leaps" (p. 20). Results of the experiment revealed that only the group receiving a combination of pentatonic and diatonic instruction had significantly higher (p =.05) performances for in-tune singing.

Other factors analyzed were tonal aptitude level as determined using the 50th percentile on the PMMA, and school population. Neither of these components was found to have a significant effect on singing skill test scores. In evaluating results of the study, Jarjisian concluded that the combination of diatonic instruction increased perception of a tonal center, and pentatonic instruction aided tuneful singing of melodic contour.

Pitch Model

Several studies on the effects of various pitch models have revealed that young children are more capable of matching pitches modeled by a child's voice, the female voice, and falsetto voice, when compared to the male voice or a keyboard model. In addition, Williams (1994) found that high school students most accurately echoed same-sex models. However, no significant differences in pitch accuracy were observed based on the gender of the students' choir teachers. The 67 subjects accurately matched pitches in a pretest to within a half-step of the model pitch. For the study, all subjects were asked to echo sing

the same patterns for both models. The descending minor third in a comfortable range was used and sung on the neutral syllable "loo." Williams found a significant difference (p = .036 for male, and p = .037 for female) for both gender models. "Male students sang slightly sharp (.81 cents) for the male model, with female subjects singing 9.5 cents sharp for the female model. Female students sharped less for the female model (5.3 cents) and male students flatted in response to the female model (-2.2 cents)" (p.42).

Sletto (1992), in a study conducted with first through sixth graders (N = 100) revealed similar results. A soprano voice, tenor voice, falsetto voice and keyboard were used as models. First graders matched the soprano model most accurately, the falsetto second, and the tenor and keyboard least. Second-graders matched the soprano and falsetto models equally well; and the tenor and keyboard the poorest. In grade three, falsetto was matched the most, followed by soprano, then tenor and finally keyboard. Fourth graders matched the soprano model most with the tenor third, and the keyboard last. Fifth graders matched the soprano most often, followed by a tie between the tenor and falsetto, with keyboard last. Finally, sixth-graders matched the soprano most often, followed by a tie between falsetto and keyboard, with the tenor model being matched least.

In a similar study Abbe (1993) tested first- and fourth-grade students (N=208) using the same types of models as Sletto. Abbe's results demonstrated that for both age groups, the soprano model was most easily matched, followed by the falsetto model in the first-grade group, and the synthesizer/keyboard model in the fourth-grade group. Abbe observed with the tenor and keyboard models that some of the children were so confused by the timbre of the model that they were unable to verbalize the test syllable, "loo,"

and responded instead with "doot," in an apparent attempt to echo the attack and release of the tone by the model.

A method found to be effective in correction of problems related to concept of pitch pattern direction is use of a vertical-keyboard instrument. Jones (1971) screened for pitch accuracy a group of second-, third-, and fourth-grade students from four different schools, who were identified by their music teachers as inaccurate singers . Only students with less than seven correct responses to the model pitches were considered for the study. From this group, three subjects were selected from each grade level of each school. Three instructional groups of 12 were formed from these participants, for a total of 72 subjects. One group from each school received instruction using a vertical keyboard, another was taught with a horizontal keyboard, and the third received conventional instruction.

Jones designed a test instrument which assessed vocal and aural skills. Vocal tasks included matching a single pitch and progressing to a series of two or three pitches. The aural tasks included determining the number of tones played, whether the tones were the same or different, and which was higher. The students also received the Bentley Measures of Musical Ability, with correlation between the scores on the two tests being .597.

The keyboard spanned the range from C3 to C6, and was altered in the following manner: (a) pitches in the normal range for children were marked with letter names; (b) a panel of red lights visible to the child was installed underneath the keyboard. Controlled by the instructor, the lights served as a reinforcement for correct responses; and (c) the keyboard was in a vertical position.

The instructional sequence for the two keyboard groups followed the Myers' (1965) steps for singing improvement which include the following:

1. discrimination of high and low pitches of extreme range
2. discrimination between high and low pitches within an octave
3. match a single pitch
4. matching short successions of two or three pitches
5. singing a short phrase
6. singing two short phrases, or one long phrase. (p.176)

Instruction began with pitch sequences used in simple songs of a small range and then progressed to more difficult material. Sol-mi, and mi-re-do patterns were used initially, with sol-mi-do and do-me-sol used later. The children located and played each pattern before singing it, after watching the instructor play the patterns .

Initial instruction began with an introduction to the keyboard in its vertical position. The teacher directed the students to the labeled keys and established the relationship of high sounds to high position and vice versa.

Pitch discrimination training began with tones more than an octave apart. The child was asked to play and sing individual pitches, with correct responses being reinforced by the lighting mechanism. Pattern matching began with the minor third. First the child played the pattern and listened, then played and sang the pattern simultaneously. Finally, he played the pattern and then sang it a cappella. Throughout the study, the children were instructed to watch the vertical patterns of the pitches as they were being played. Instruction was the same for the horizontal keyboard group, with the exception that instead of "high" and "low" and "up" and "down" being used in the spatial sense, they were used in the abstract to identify the relationships of sounds.

The third group, who received conventional remedial instruction, was not limited to the Myers sequencing of skills. Their instruction included visual and

physical representation of pitches, but the children did not play the keyboard, which was used only as a pitch-giving device.

Following a 12-day period of instruction with each student receiving 15 minutes of instruction per day, the posttest was administered. The gains over the pretest levels were significantly greater for the vertical keyboard group at .05 level. The highest gains were in the vertical keyboard group (m=16.33), with the next highest for the conventionally instructed group (m=10.25). Some common problems corrected most readily by the vertical keyboard instruction included a lack of understanding of the concept of pitch direction, inattention, and lack of development of the upper range.

Hermsen (1996) attempted to determine the effect of learning to play recorder in conjunction with vocal instruction on third- and fourth- graders' pitch accuracy (N=53). For the pretest, students were tape recorded echoing the patterns mi-re-do and do-re-mi, sung a by female on the pitches B4-A4-G4 and G4-A4-B4.

After the pretest, students in the experimental group received six weeks of recorder study, during which they vocalized the songs and exercises they played. Solfege, note names and "loo" were used in the vocalizations. The control group spent the six weeks singing the same tunes the experimental group was playing. Their vocal practice was identical to that of the experimental group.

Following the posttest, a Mann-Whitney U Analysis revealed no significant differences between the experimental and control groups' pitch accuracy. However, Hermsen recommended that the study be replicated with a larger group, consisting of all fourth-graders from a specific school over the course of a year.

To summarize, research by Sletto (1992), Abbe (1993), and Williams (1994) has revealed that pitch model has an effect on children's ability to match a pitch. In general children seem to more readily match models that are like their voices. Instruction with Jones' (1979) vertical keyboard produced significant gains in pitch accuracy in inaccurate singers, while Hermsen (1996) saw no effect of recorder playing on pitch accuracy.

Summary

Throughout the past 150 years, music teachers have struggled to improve their students' quality of singing. The vast body of research related to pitch accuracy is an indication that singing is a complex skill and is affected by a number of factors, including accompaniment, age, gender, model, home environment, experience playing instruments, and kinesthetic perception.

One finding on which researchers generally agree is that pitch accuracy improves with age. Discrepancies exist regarding the effects of gender, but many experts believe that in the primary grades, girls tend to sing more accurately than boys.

A major challenge in researching pitch accuracy is that its development must be measured indirectly; when pitch accuracy improves, the researcher is often unaware of what caused the improvement. Were researchers better able to chronicle its development, more efficient methods for improving pitch accuracy could be implemented, rather than the trial-and-error method used initially in Joyner's study (1969). However, the literature reviewed here indicates that the music educator has a number of options for approaching the problem of the inaccurate singer.

Purpose of the Study

In an effort to further investigate vocal development in young children, this study will be conducted to determine the effect of repeated listenings, one of the basic principles of the Suzuki method, on the pitch accuracy of first graders.

CHAPTER III

Procedures

Introduction

The purpose of this study was to examine the effects of repeated listenings to a song being learned on pitch accuracy skills of first-grade children. Pitch inaccuracy was operationally defined as any singing which is "off-pitch" (Aaron, 1990). The independent variables of instruction and gender were examined in relationship to the dependent variable, pitch accuracy skills. A test of repeated measures was used to analyze the data. Alpha levels were set at .05. Scores of pitch accuracy were evaluated by a State of North Carolina certified music specialist, using a Likert-type scale based on the Rutkowski (Phillips, 1992) scale which was altered by Atterbury and Silcox (1993).

Subjects

Subjects for the current study included two randomly selected intact first-grade classes (N = 25) from Startown Elementary School in Catawba County, North Carolina. Startown has a student population of approximately 700 students from kindergarten through grade six and is located in a rural area.

Permission to conduct the study was granted by the Superintendent of Catawba County Schools, Appalachian State University Research Committee, and parents of the subjects. (See Appendix A for letters of permission.) After obtaining agreement from two first-grade teachers to allow their students to participate in the study, treatment and control group assignments were designated. The experimental group (n = 11) consisted of children from one of

the first-grade classes, while the control group (n = 14) consisted of children from the other first-grade class. All students from the two classes were considered for the study, however, only those whose parents granted permission for their participation were administered the tests. Treatment consisted of the experimental group (n = 11) receiving repeated listenings during regular class time to a song learned in music class, "Find the Ring", (Silver Burdett & Ginn 1996, grade one, p. 86). The control group (n = 14), who were also taught the song in music class, received no additional listenings in their regular classroom. A profile of distribution of male and female subjects by instructional group is presented in Table 1.

Table 1

Subject Profile

	Male	Female	Total
Additional listenings	6	5	11
No additional listening	8	6	14

Treatment

Music Instruction

During the two weeks of instruction and treatment, the experimental and control groups each attended their regular 45-minute weekly music classes where, during the first week, they were taught the song "Find the Ring" (Silver, Burdett & Ginn, 1996) by a State of North Carolina certified music specialist. Music Instruction for both groups was the same. The next week in music class, each group received a ten minute review of the song. Treatment for the experimental group consisted of receiving four listenings four times a day for five consecutive days during regular classroom time to a tape recording of a

child's voice singing "Find the Ring." The control group received no additional listenings during regular class time. Table 2 presents the schedule of instruction, treatment, and review.

Table 2

Schedule of Instruction, Treatment, and Review

Group	Week 1	Week 2
Experimental	taught song; adminstered pretest; received additional classroom listenings;	received ten-minute review in music class; administered posttest
Control	taught song; administered pretest	received ten-minute review in music class; administered posttest

Instruction for both experimental and control groups consisted of learning the song, "Find the Ring" during music classes which met from 8:30 A.M. to 9:15 A.M, with the experimental group meeting on Thursday, and the control group on Friday. Classes were taught by the same music specialist. Both classes began with gathering activities and songs. The specialist introduced "Find the Ring" to the students by singing it a capella as they listened. She then sang it and accompanied herself with guitar chords. The subjects then echoed each phrase as she sang it again. All students sang the entire song, and for variation in practice, all girls sang it, and then all boys. A pretest was administered immediately following the music classes in which the song was learned.

Data Collection and Analysis

Pretest

To obtain pretest pitch accuracy skill levels before treatment, an adaptation (Atterbury and Silcox, 1993) of Rutkowski's Likert-type scale (Phillips, 1992) was used to evaluate the pitch accuracy of each subject.

Following recommendations from Atterbury and Silcox (1993), the Rutkowski scale was modified to maintain accuracy and agreement in scoring.

1 - presinger: does not sing, but chants the text.

2 - uncertain singer: sustains tones, uses both speaking and singing voices

3 - partial singer: sings some phrases correctly, but not entire song

4 - singer: sings entire song correctly in one key.

An interrater reliability coefficient of $r = .747$ was found for the Rutkowski test by Atterbury and Silcox (1993).

The researcher administered the pretest to each child individually by singing "Find the Ring" for the child while playing the melody on a Roland electronic keyboard. Because the test was for melodic, not textual accuracy, the researcher sang the song on the syllable, "la," rather than using the words. Following the demonstration, the researcher told the subject it was his turn to sing the song. She demonstrated the first three pitches, "sol, mi, sol" on the neutral syllable, "la," and the subject was then tape recorded singing the song on the neutral syllable. The researcher accompanied the subject by playing the melody on the electronic keyboard. In order to test the subjects for equal ability grouping, the tapes were rated for pitch accuracy according to the altered Rutkowski scale (Atterbury and Silcox, 1993) by a State of North Carolina certified music specialist.

Posttest

Following the period of treatment and review, the subjects were posttested by the same method used for the pretest. The tape recordings of the posttests were then evaluated by the same music specialist for pitch accuracy. The specialist designated a score from the altered Rutkowski scale for pre- and posttests for each subject.

Following the scoring procedure the data were analyzed at Appalachian State University, using a test of repeated measures included in Statistical Package for the Social Sciences.

CHAPTER IV

Results

Introduction

The purpose of this study was to determine if there was a significant difference in pitch accuracy skills of first-graders who, during regular classroom time, received repeated listenings to a song being learned in music class, and the pitch accuracy skills of first-graders who received no additional classroom listenings ($N = 25$). The principle null hypothesis was stated as follows: There is no significant difference between the posttest means of pitch accuracy scores of first-graders who receive repeated listenings to a song being learned and those who receive no additional listenings. The secondary research hypothesis was: 1) There is no significant difference between pottest means of pitch accuracy scores attributed to gender.

Subjects for the study were two randomly selected intact first-grade classes ($N = 25$) from Startown Elementary School in Catawba County, N.C. A rural school, Startown has a population of approximately 700 students. The experimental group ($n = 11$) consisted of six males and five females. The control group ($n = 14$) was comprised of eight males and six females. (see Table 1, Chapter III for subject profile).

In order to obtain scores for use in the test of repeated measures, a pretest for pitch accuracy on the song being learned in music class was administered by the researcher before treatment began. Treatment consisted of the experimental group receiving repeated listenings during regular classroom

time to a song being taught in music class. The control group received the same instruction in music class, but no additional listenings outside of music class.

Pretest Data Analysis

To test for pretreatment pitch accuracy levels on the song learned in music class, an adaptation (Atterbury & Silcox, 1993) of Rutkowski's Likert-type scale (Phillips 1992) was used to evaluate the pitch accuracy of each subject's performance of the song. The pretest was administered by the researcher who demonstrated the song, "Find the Ring" for each subject, singing the melody on "la". She then modeled the first three notes, and asked the subject to sing the song on "la" as she played the melody on a Roland electronic keyboard. Each performance was tape recorded.

Following administration of the pretest, a certified music specialist scored the performances according to the altered Rutkowski scale (Phillips, 1992). The results of the pretest scores are presented in Table 3.

Table 3

Pretest Means and Standard Deviations

Experimental	Mean	Std. Deviation
male	2.17	.98
female	2.40	.55
total	2.27	.79

Control	Mean	Std. Deviation
male	2.13	.64
female	2.50	.55
total	2.29	.61

All Subjects	Mean	Std. Deviation
male	2.14	.77
female	2.45	.52
total	2.28	.61

Following evaluation of the pretests, the scores were examined by an analysis of variance (ANOVA) for equal ability grouping by gender and group. This analysis revealed no significant difference ($p < .05$) in pitch accuracy skills according to gender or group (see Table 4).

Table 4

Pretest Analysis of Variance for Group: Gender

Source	df	Sum of Squares	Mean Square	F	p
Group	1	1.039E-03	1.039E-03	.002	.963
Gender	1	.598	.598	1.318	.263

$p < .05$

Posttest Data Analysis

Principal Research Objective

The principle purpose of this study was to determine if repeated listenings during regular classroom time to a song being learned in music class had a significant effect on the pitch accuracy skills of first-grade children when compared to a group administered no additional listenings.

The null hypothesis is stated: There is no significant difference ($p < .05$) between the pitch accuracy skills of first grade children who receive repeated listenings during regular classroom time to a song being learned and first-grade children who receive no additional listenings.

Posttest Procedure

After a week of treatment, with the experimental group receiving a total of 16 listenings a day for five consecutive days, and each group receiving a ten-minute review of the song during music class, a posttest using the same procedure as the pretest was administered by the researcher. The pitch accuracy scores were derived by a music specialist using the altered Rutkowski scale (Atterbury & Silcox, 1993). Posttest results are presented in Table 5.

Table 5

Posttest Means and Standard Deviations

Experimental		
	Mean	Std. Deviation
male	2.5	.84
female	3.2	.84
total	2.82	.87
Control		
	Mean	Std. Deviation
male	2.38	.52
female	2.83	.75
total	2.57	.65
All Subjects		
	Mean	Std. Deviation
male	2.43	.65
female	3.00	.77
total	2.68	.75

Analysis and Results of Test of Repeated Measures

A test of repeated measures was used to analyze and compare pre- and posttest scores. A significant difference ($p = .001$) was found between pre and posttest scores of all subjects regardless of group or gender. There were no significant differences attributed to group or gender on the test of repeated measures. However, Graph 1 illustrates that the experimental group demonstrated greater improvement. Results of the test of repeated measures are presented in Table 6.

Table 6

Results of Test of Repeated Measures

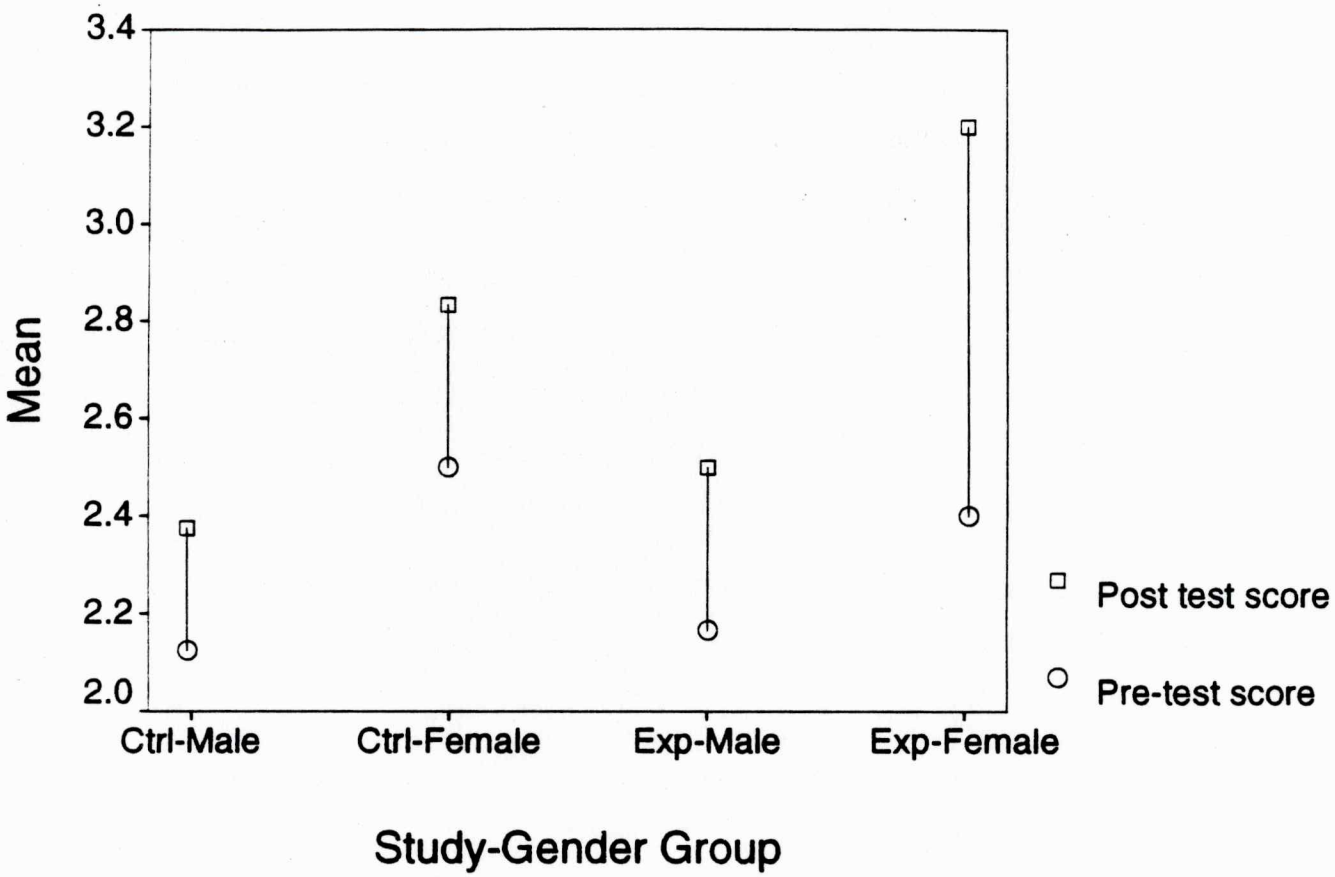
Source	F	p
Pre/Posttest	13.493	.001*
Group	.230	.252
Gender	.230	.252
Group/Gender	.673	.421

*($p < .05$)

While Table 6 reveals no significant difference attributable to group or gender, analysis of mean scores reveals the largest increase in scores from pretest ($m = 2.40$) to posttest ($m = 3.20$) to be those of the females in the experimental group, as compared with those for the control group females for the pretest ($m = 2.50$) and posttest ($m = 2.83$). Figure 1 presents these results also.

Figure 1

Mean Scores for Pre- and Posttest



Summary

The results of the final statistical analyses presented in Chapter IV are summarized below.

Posttest Results: Principal Research Objective

1. Results of an analysis of repeated measures revealed that there was no significant difference [$F = 13.493$] $p < .05$ between the pitch accuracy skills of a group receiving repeated listenings during regular class time to a song being learned, and a group who received no additional listenings outside of music class. However, there was a significant difference ($p = .252$), between the pretest means ($m = 2.28$) and posttest means ($m = 2.68$) of all subjects. In addition, the experimental group demonstrated the greatest gain between pretest ($m = 2.27$) and posttest ($m = 2.82$) means.

1. No significant differences were found between pitch accuracy scores attributed to gender.

The test of repeated measures revealed a significant difference ($p = .001$) between the pre- and posttest scores of all subjects regardless of group or gender. No other significant differences were found. While the mean scores of all subjects increased from pre- to posttest, the greatest increase was among the females of the experimental group from ($m = 2.4$) for the pretest to ($m = 3.2$) for the posttest.

CHAPTER V

Summary and Conclusions

Summary

The purpose of this study was to examine the effects of repeated listenings to a song being learned on the pitch accuracy skills of first-grade children. Pitch inaccuracy was operationally defined as any singing which is "off-pitch" (Aaron, 1990). The experimental group consisted of first-grade children (n = 11) who received repeated listenings during regular class time to a song being learned in music class. The control group consisted of first-grade children (n = 14) who received no additional listenings during regular class time. The principle null hypothesis statement was stated as follows: There will be no significant difference between the pitch accuracy skills of first graders who received repeated listenings during regular classroom time to a song being learned and those who received no additional listenings outside of music class. The secondary hypothesis was: There is no significant difference in pitch accuracy attributed to gender.

Each first-grade class was taught a song, "Find the Ring" (Silver, Burdett, & Ginn, 1996) during music class by a state of North Carolina certified music specialist. To evaluate pitch accuracy of all subjects, the researcher administered a pretest during which each subject was tape recorded singing the song.

During the five-day treatment period, the experimental group received four listenings four times a day to a child singing the song. The control group

received no listenings. Each group also had an additional ten-minute review of the song during regular music class.

Following the treatment period, all subjects were administered a posttest for pitch accuracy on the song which was tape recorded by the researcher. Scores for pre- and posttests were derived by a State of North Carolina certified music specialist, using a Likert-type scale created by Rutkowski (Phillips, 1992) and altered by Atterbury and Silcox (1993) to increase reliability.

The primary and secondary null hypotheses were tested using a test of repeated measures, which compared pre- and posttest scores for all subjects, for each group, and gender. The primary null hypothesis regarding the effects of treatment was retained. There was no significant difference between posttest means attributed to treatment. The secondary hypothesis was also retained. There was no significant difference in pitch accuracy attributed to gender.

Conclusions

The principal research objective for the present study was to examine the effects of repeated listenings outside of music class to a song being learned on the pitch accuracy skills of first-grade children. Data analysis revealed that children who receive repeated listenings did not score significantly higher ($p < .05$) on the posttest pitch accuracy test than students who received no additional listenings.

The literature contains much research indicating that singing accurately is a complex skill. Abbe (1993), Apfelstadt (1988), and Joyner (1969), claimed that singing involves all three domains of learning. The psychomotor domain controls the physical elements of singing. Pitch discrimination and tonal recall are controlled by the cognitive domain, and the affective domain involves the desire to sing. Each of the domains of learning were addressed by the current study. The act of repeated listening heightens tonal recall (cognitive) and may

increase the desire to sing (affective). Most of the subjects were enthusiastic about having their voices tape recorded, as well.

The circumstances under which a child sings may affect his pitch accuracy as well. Goetze and Horii (1989) found that children sing more accurately alone than they do in groups. The subjects involved in the current study had opportunities to sing under several different conditions. During music class, they sang as a group, while they sang alone for the pre- and posttests. There were no tests conducted to observe pitch accuracy scores of the two groups based on the variable of solo singing vs. group singing.

Vocal models which more closely approximate the voice of a child have a positive effect on children's pitch matching ability (Abbe, 1993). The adult female soprano voice was utilized in both teaching and testing subjects in the current study.

Piano accompaniment was found to have no significant effect on the pitch accuracy of children (Atterbury and Silcox, 1993). In the current study, accompaniment for testing the subjects for pitch accuracy consisted of playing the melody of the song on the piano setting of an electronic keyboard.

Aaron (1990) found that instruction in physical coordination of the body and voice in regard to breathing, posture, and the open pharynx had a significant effect on the pitch accuracy of inaccurate singers. Joyner (1969) described similar techniques which he used to help inaccurate singers, including using the lower lungs to conserve breath and checking in a mirror for the open mouth and throat. Jones (1971) found that melodic instruction using a vertical keyboard to relate the concept of ascension and descension of pitch was helpful in improving pitch accuracy.

Although none of these variables were considered in the current study, the improvement of mean pitch accuracy scores from pre- to posttest especially for

the females of the experimental group, might suggest that a combination of repeated listenings and some of the techniques above might prove helpful in remediation for pitch accuracy. Finally, it is evident from the volume of research literature that pitch accuracy is a serious problem for music educators and is worthy of continued study.

Although the current study showed no significant difference attributed to repeated listenings, the significant difference between the pre- and posttests means of all subjects indicates that some improvement was achieved overall, and may be indicative of a trend due to the effects of the treatment. Indeed, the experimental group's pretest scores were slightly below those of the control group, resulting in a greater improvement in the experimental group's posttest scores.

In addition, it should be noted that no literature on the effect of Suzuki-style listening on pitch accuracy could be located. Because Suzuki philosophy espouses early intervention, i.e. exposing a child to music listening from birth, it is possible that earlier and long-term exposure may net a greater improvement.

Another factor which could have affected results was the smaller number of females in the experimental group. The females of both groups had the highest mean scores with the females of the experimental group showing the largest improvement. Perhaps future studies could address gender as related to the effect of repeated listenings on pitch accuracy skills.

Secondary Research Objective

Some of the results of the current study are consistent with those found in the literature, specifically the higher pitch accuracy scores of the female subjects. Although no significant difference attributed to gender was found, the mean scores for the female subjects of both groups were consistently higher in pre-and posttests, with the females of the experimental group showing the most

improvement. These findings are congruent with the results of studies performed by Aaron, 1990; Goetze and Horii, 1989; Phillips, 1992; and Stauffer, 1985. Therefore music educators should be aware of this finding and make the necessary adjustments when teaching pitch accuracy skills.

Summary of Conclusions

1. Repeated listenings outside of music class to a song being learned in music class produced no significant difference in the pitch accuracy scores of first-grade children. However, a significant difference was found between pre- and posttest scores for all subjects.

2. No significant difference attributed to gender was found on pitch accuracy skills. Nonetheless, the female subjects of both groups demonstrated higher mean scores than the males, with the females of the experimental group showing the greatest improvement.

Recommendations for Further Research

There is much literature available on the subject of pitch accuracy. Indications that females have better pitch accuracy skills than males, and that pitch accuracy improves with age are common to many studies. Minimal research has been conducted, however, on the effect of Suzuki-style repeated listening on pitch accuracy.

An extension of the current study should focus on the selection of a larger, randomized sample, with a longer treatment and review period. A longitudinal study of 6-8 years, beginning with repeated listenings in infancy should be conducted.

In conclusion, the results of the current study support both review and repeated listenings as modes for improvement in pitch accuracy. The act of singing is complex and dependent on a number of cognitve and psychomotor skills, and it is recognized that the present study should be replicated and

expanded in order to make a greater contribution to the literature available to music educators.

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APPENDIX A
Consent Forms

COVERSHEET

REQUEST FOR REVIEW OF HUMAN SUBJECTS RESEARCH

1. Principal Investigator Amalie Hinson

   Faculty Advisor (if PI is a student) Dr. Elizabeth Rose

2. Department and School School of Music

3. Telephone No. 262-6444

4. Project Title The Effects of Repeated Song Listenings on the Pitch Accuracy of First-Grade Children

5. Check all that apply: (x) a specific project ( ) a grant proposal ( ) a protocol change ( ) faculty ( ) staff (x) graduate student ( ) undergraduate

6. Funding source N/A

7. This is: (x) a new project ( ) an annual renewal

8. Type of Review Requested - PI's recommendation: (See Part Two, Section III for criteria)
   (X) Exempt or Expedited ( ) Full

Amalie Hinson — Signature of Principal Investigator — Date 4/3/97

E. Rose — If PI is student, signature of Faculty Advisor — Date 4-4-97

9. IRB Chair recommendation:

   ( ) Exempt from IRB Review

   (✓) Expedited Review

   ( ) Full Review

10. Final Recommendation:

    ( ) Exempt ( ) Approved with conditions

    (✓) Approved ( ) Not approved

Joel A. Thompson — Signature of Chairperson, Institutional Review Board or Designee — Date 4/7/97

CHECKLIST FOR RESEARCH INVOLVING HUMAN SUBJECTS

Please type and submit two copies to the Chairperson, IRB, c/o Office of Research and Graduate Studies

Respond to all questions. Attach additional sheets as needed. Staple all pages together when finished.

Attach copies of questionnaires, non-standard tests, consent forms, and other supporting documents.

1. Purpose of proposed research.

   The purpose of this study will be to examine the effects of repeated song listening on the pitch accuracy of 1st-grade children.

2. Give a brief description or outline of your research procedures as they relate to the use of human subjects. This description will include the subjects themselves (methods of recruiting; inducements to participate), instructions given to them, activities in which they will engage, and tests and questionnaires, plus a discussion on the procedures for obtaining informed consent. There must be assurance that no pressure will be employed in soliciting student involvement. Note if the subjects are minors or "vulnerable" (children, prisoners, mentally or physically infirm, pregnant women) and how their special conditions will be handled.

   A pretest-posttest 2 x 2 ANOVA design will be used to collect and analyze data. Subjects for the study are two randomly selected intact 1st-grade classes (N = 49) from Startown Elementary School in Newton, N.C. Treatment will consist of the experimental group (n = 25) receiving repeated listenings to a song learned in music class, with the control group (n = 24) receiving no listenings. See attached for complete details.

3. Does this research entail possible risk of psychic, legal, physical, or social harm to the subjects? Please explain. What steps have been taken to minimize these? What provisions have been made to insure that appropriate facilities and professional attention necessary for the health and safety of the subjects are available and will be utilized?

   The subjects are at no increased risk of psychic, legal, physical, or social harm.

4. The potential benefits of this activity to the subjects and to humans in general outweigh any probable risks. This opinion is justified by the following reasons:

   The subjects may benefit from having improved singing skills as a result of participation in the study. Students will participate on a voluntary basis and are at no increased risk of harm.

The individual pretest will consist of tape recording each subject singing the song after learning it in music class. The researcher will demonstrate the first three notes of the song and then ask the subject to sing the complete song as the researcher plays the melody on a keyboard. Prior to the pretest the researcher will be introduced to each class and will explain their participation in the study. Following treatment, the posttest will be administered in the same manner as the pretest. Consent has been obtained from the principal and superintendent's office. Parental consent will be obtained through distribution of consent forms.

5. How will prior informed consent be obtained? A copy of your consent form must be attached.

Prior informed consent will be obtained through the distribution of the attached parental consent form.

6. Will the confidentiality of all subjects be maintained? If yes, how is this accomplished? If no, has a formal release been obtained?

Confidentiality of all subjects will be maintained. There will be no identification of individual subjects' tests indicated on the tape recordings.

7. Do the data to be collected relate to illegal activities? _x_ No ___ Yes
If yes, explain.

8. Is deception involved? _x_ No -- ___ Yes
If yes, explain.

9. Are all subjects protected from the future potentially harmful use of the data collected in this experiment? How is this accomplished?

The data collected in this study is not of a compromising nature. In addition, identification of subjects will be recorded.

I have read Appalachian State University's Policy and Procedures on Human Subjects Research and agree to abide by them. I also agree to report any significant and relevant changes in procedures and instruments as they relate to subjects to the Chairperson of the IRB.

Amalia Hinson — Principal Investigator

4-3-97 — Date

Dr. Liz Rose — If PI is student, Faculty Advisor

Other Investigators

Dear Parents,

I am seeking permission for your child to be a part of a music research project that will be conducted at Startown Elementary School. The purpose of this project is to discover if repeated listening to a song the children are learning in music class will affect their ability to sing on pitch. Two first grade classes are participating in this project.

Mrs. Williams, the music teacher at Startown, will teach the children a song. I will then tape record each child singing the song individually to test pitch accuracy. This will be done privately. At no time will your child be identified, nor will his test be made available publicly. The children will review the song in music class, and one of the classes will be exposed to brief periods of listening to the song during the school day. Following this week-long review period, I will again test the children for pitch accuracy by tape recording their performances of the song.

The office of the superintendent of Catawba County Schools and Mrs. Johnson have approved this research project. I am a certified music educator and am seeking a Master's degree in music education at Appalachian State University. I am also the parent of a student at Startown. Please feel free to contact me, Mrs. Johnson, or Mrs. Williams with concerns about the project. Thank you for your consideration in this matter. Please return this sheet promptly to your child's classroom teacher.

Respectfully submitted,

Amalie Hinson
phone # 465-2424

Mrs. Johnson
Principal, Startown Elementary

My child, _____, has permission to participate in the music research project.

My child, _____, does not have permission to participate in the music research project.

_____
Parent signature

Please return no later than Wednesday, April 9.

VITA

Amalie Joanna Walker Hinson was born in Elkin, North Carolina, on March 9, 1963. She was educated in the Wilkes County and Elkin City School systems. In May of 1995, she received the Bachelor of Music degree in Music Education from Lenoir-Rhyne College in Hickory, North Carolina. After teaching public school music for a year, Ms. Hinson began study toward a Master's degree at Appalachian State University. During her studies at Appalachian State, Ms. Hinson was chosen as the first recipient of the Athena Award for research.

The author is a member of the Music Educators National Conference and teaches music courses at Catawba Valley Community College in Hickory, North Carolina. Ms. Hinson's address is 1873 NC Highway 10 West, Newton, North Carolina. She is married to Douglas Hinson and has two children, Ethan and Edy.